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(71) Applicant(s)
Northern Telecom Limited
(Incorporated in Canada - Quebec)

**World Trade Center of Montreal, 380 St Antoine
Street West, 8th Floor, Montreal, Quebec H2Y 3Y4,
Canada**

(72) Inventor(s)
Alan Donaldson
Steven John Freer

(74) Agent and/or Address for Service
S F Laurence
Nortel Limited, Patents & Licensing, West Road,
HARLOW, Essex, CM20 2SH, United Kingdom

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(56) Documents Cited
GB 2215082 A GB 2124402 A GB 2064862 A
GB 2003294 A

(58) Field of Search
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(54) Hermetic metallised optical fibre feed-through

(57) An optical fibre hermetic feed-through for polarisation maintaining fibre 16 has, contained within a hollow metallic plug 31, a ceramic ferrule (22, Fig.3) is a concentricity providing sliding fit around the fibre and serves to hold the fibre centred in an aperture in the end wall of the plug. The fibre is secured with adhesive in the bore of the ferrule which is similarly secured within the plug. An hermetic seal between plug and a metallised portion of the fibre is provided by a soft solder fillet 41.

A crimpable metal support sleeve (20, Fig.3) may be used. Wall 10b is shown.

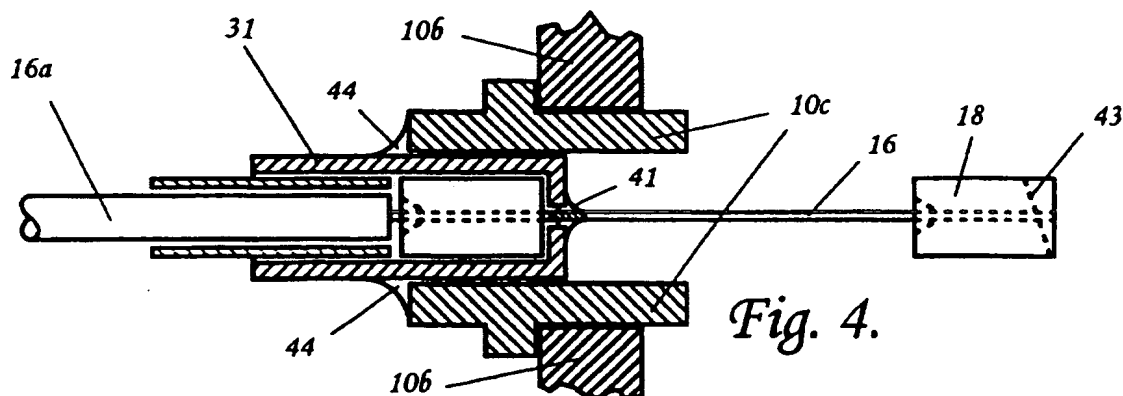


Fig. 4.

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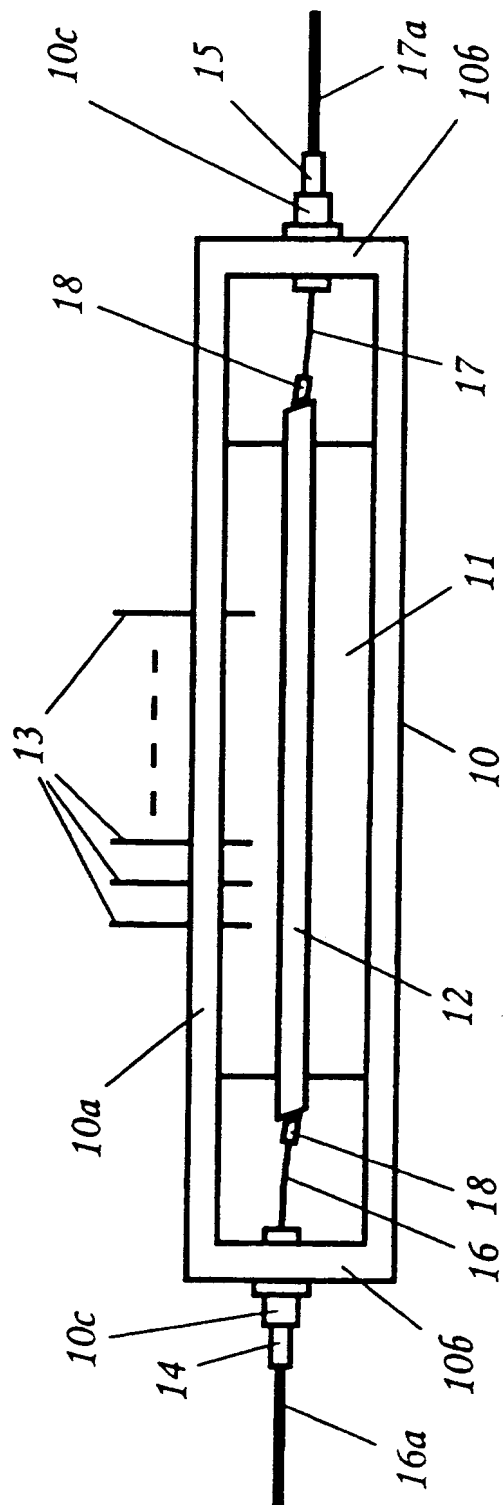


Fig. 1.

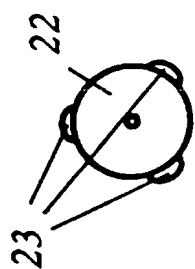


Fig. 2a.

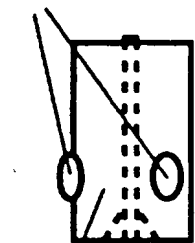


Fig. 2.

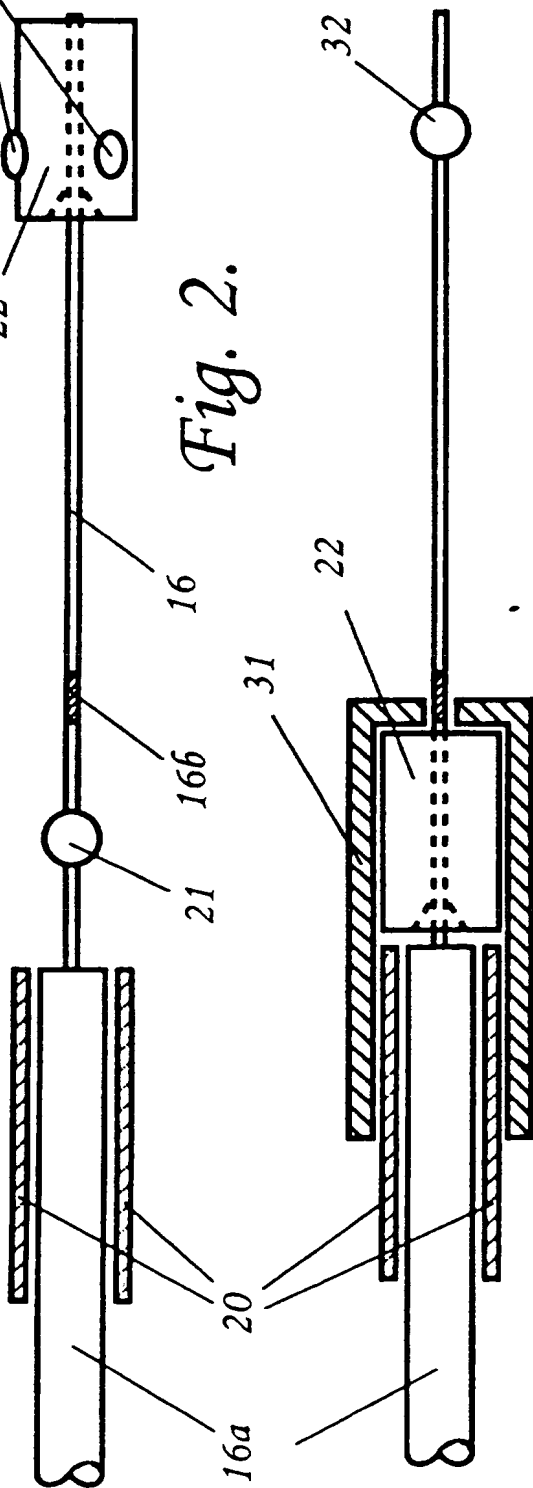


Fig. 3.

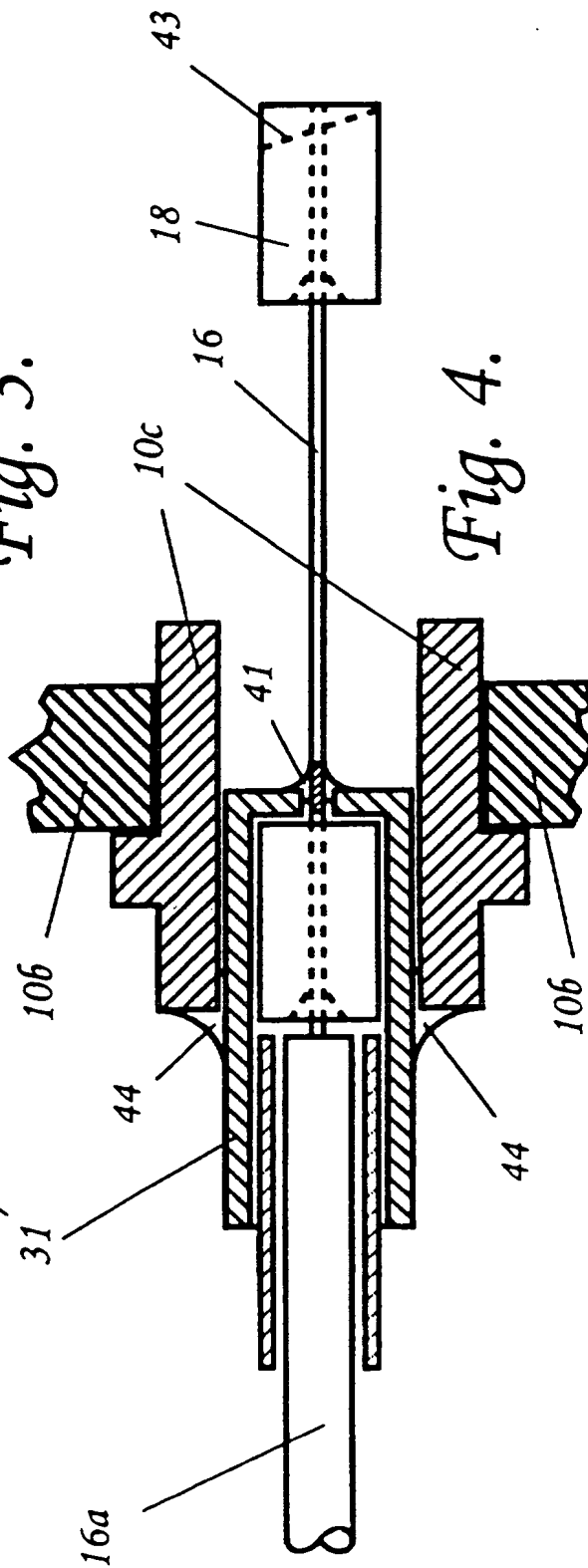


Fig. 4.

has less clearance around the fibre than does the bore of the hypodermic tubing, the ferrule bore having a flared end to facilitate the threading of the fibre. In its turn this ferrule holds the fibre relatively well centred in the small bore of the plug 31. This is in contrast with the

5 situation pertaining with the hypodermic tubing in which, in default of any mechanism for centring the fibre within the tubing, the fibre is most liable to rest in contact with the inner wall of the tubing over a significant portion of the length of that tubing.

10 The plug 31 is dimensioned to slide freely through the central bore of the bush 10c in the end wall 10b of the box 10. The ferrule 18 is threaded through the bore of the bush and is secured in position on the end face of the lithium niobate bar 12. The length of bore fibre 16 protruding from its plastics protective coating 16a is chosen so that, with the ferrule 18 in

15 position on the end face of the bar 12, the forward end of the plug 31 lies engaged within the bore of the bush 10c. The plug 31 is then hermetically sealed in position in the bush 10c by means of a solder fillet 44, the bush having previously been hermetically sealed in position in end wall 10b by brazing. Because of the linear and angular offset of the

20 axis of the ferrule 18 with respect to the plugs 31, the bare fibre 16 extends in an arcuate path between the two which, after the securing of the plug 31 to the bush 10c, can readily accommodate small changes in position of the ferrule 18 with respect to the plugs 31 occasioned for instance by effects of thermal expansion mismatch.

25 Stress in the feed-through 15 is in no way so critical if, as is generally the case, the fibre 17 is circularly symmetric rather than polarisation maintaining fibre. Therefore it is not strictly necessary to employ the same low-stress configuration as used in feed-through 14, though

30 generally it is found more convenient to do so.

CLAIMS:

1. A package having at least one wall through which an optical fibre hermetic feed-through extends, which feed-through includes
5 a metallic cylindrical plug with a substantially axial small bore in one end thereof which small bore is dimensioned to be a concentricity providing sliding fit around a portion of metallised bare optical fibre, and which small bore opens out internally into an enlarged substantially co-axial bore that is dimensioned to be a concentricity providing sliding fit around
10 a cylindrical ferrule provided with an axial bore dimensioned to a concentricity providing sliding fit around the metallised bare fibre, wherein the fibre is secured to the ferrule with adhesive within its bore, wherein solder at the point of emergence of the fibre from the small bore end of the plug provides an hermetic seal between the metallised bare
15 fibre and the plug, and wherein the plug is hermetically sealed within an aperture extending through said at least one wall of the enclosure.
2. A package having an optical fibre feed-through as claimed in claim 1, which feed-through is a polarisation maintaining optical fibre
20 optical feed-through.
3. A package as claimed in claimed 1 or 2, wherein the fibre is provided externally of the enclosure with a plastics protective coating that terminates within the enlarged bore of the plug adjacent one end of
25 the sleeve.
4. A package as claimed in claim 2, wherein a length of sleeving engaged around the plastics protective coating of the fibre has one end inserted in the enlarged bore of the plug and is secured to both
30 the plug and the plastics protective coating.
5. A package as claimed in any preceding claim, wherein the cylindrical ferrule is a ceramic cylindrical ferrule.
- 35 6. A package as claimed in any preceding claim, which package houses an electro-optic modulator, wherein the optical fibre

terminates within the package and wherein the end of the fibre lying within the package is optically coupled with the modulator.

7. A package as claimed in claim 6, wherein the end of the
5 fibre within the package is housed in the axial bore of a second ceramic ferrule which second ferrule is secured with adhesive to both the fibre and the modulator.

8. A package as claimed in claim 7, wherein the fibre extends
10 between the plug and the second ferrule in an unconfined arcuate path.

9. A package provided with at least one polarisation
maintaining optical fibre hermetic feed-through substantially as
hereinbefore described with reference to the accompanying drawings.

15 10. A lithium niobate optical modulator hermetically enclosed in a package as claimed in any preceding claim.

11. A method of making an optical fibre hermetic feed-through
20 which feed-through includes a metallic plug provided with a bore dimensioned to be a sliding fit around a metallised portion of bare fibre, wherein fibre positioning means to which the fibre is secured is engaged with the plug so as to hold the fibre substantially concentric within said bore and wherein, while so held, the fibre is hermetically sealed within
25 said bore by solder which is substantially uniformly distributed around the fibre within said bore.

12. A method of providing an hermetic feed-through of a length
of optical fibre through a metallic wall of a package, wherein a length of
30 plastics protective coated optical fibre has a length of its plastics protective coating stripped from one end to leave bare fibre a portion of which is then metallised, wherein a ferrule and then a metallic cylindrical plug are threaded over the fibre, the metallic plug having a substantially axial small bore in one end thereof, which bore is dimensioned to be a
35 concentricity providing sliding fit around the metallised bare fibre and which small bore opens out internally into an enlarged substantially co-

axial bore that is dimensioned to be a concentricity providing sliding fit around the ferrule, and the ferrule having an axial bore dimensioned to be a concentricity providing sliding fit around the metallised bare fibre, wherein the bare fibre is secured in the bore of the ferrule and the ferrule is secured in the enlarged bore of the plug, and wherein solder forming an hermetic seal is applied formed into a fillet uniting the metallised bare optical fibre to the plug at the point of emergence of the fibre therefrom.

13. A method of making an hermetic optical fibre feed-through substantially as hereinbefore described with reference to the accompanying drawings.

14. An optical fibre hermetic feed-through made by the method claimed in claim 11 or 12.

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Patents Act 1977

Examiner's report to the Comptroller under Section 17
(The Search report)

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Relevant Technical Fields

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(ii) Int Cl (Ed.6) G02B

Search Examiner
MR C ROSS

Date of completion of Search
25 SEPTEMBER 1995

Databases (see below)

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii)

Documents considered relevant
following a search in respect of
Claims :-
1-14

Categories of documents

- X:** Document indicating lack of novelty or of inventive step. **P:** Document published on or after the declared priority date but before the filing date of the present application.
- Y:** Document indicating lack of inventive step if combined with one or more other documents of the same category. **E:** Patent document published on or after, but with priority date earlier than, the filing date of the present application.
- A:** Document indicating technological background and/or state of the art. **&:** Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages	Relevant to claim(s)
X	GB 2215082 A (STC) see especially Figure 1	1 at least
X	GB 2124402 A (STC) see especially Figure 6	1 at least
X	GB 2064862 A (PHILIPS) see especially page 1 lines 80-81	1 at least
X	GB 2003294 A (ISEC)	1 at least

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).